

## Chapter 3

# A technological innovation plan for enterprises in the Azores

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### Introduction

The Azores Region has the status of one of the 'outermost regions' of EU. The GNP per capita for RAA in 2003 (expressed in parity of buying power) is around 64 per cent of the EU average and 88 per cent of national Portuguese average. The rate of development of RAA, since 2000, has approached the EU average, which means that Azores is no longer considered to be one of the less developed regions of the EU (RAA, 2008a). In terms of significance for the regional economy, the agro-food and agro-forestry industries, in parallel with fisheries, perform a central role as one would expect in an isolated insular territory.

The *Technological Innovation Plan for Enterprises* in the Autonomous Region of the Azores (RAA), hereafter called *INOTEC–Empresa* Plan, was developed over the period 2006/2007 at the request of the Regional Government, with the main aim of promoting innovation within small and medium enterprises. The strategic vision defined within *INOTEC–Empresa* Plan was ambitious

*To develop the Azores Autonomous Region (RAA) into one whose competitiveness is above the national average, while at the same time being the most attractive and having the best quality of life in Portugal, for its residents and visitors.*

(Simão, 2008):

With this vision in mind, the *INOTEC–Empresa* Plan aims (*op. cit.*):

*[...] to formulate the policies and programmes to be developed within the forthcoming European Structural Funds Framework Programme for Portugal and specifically for the RAA, over the period 2007-2013 (RAA, 2008a; b) and [to define] its strategic and specific objectives, together with the methods and tools for its realisation, suggesting performance metrics to monitor and assess its implementation and the use of corrective measures.*

The methodological approach used to devise the *INOTEC–Empresa* Plan is presented in the next section. The third section outlines an overview of the Plan. Subsequent sections focus on the programmes for ‘*Qualification of human resources*’ and the ‘*Development of scientific and technological capacities for Innovation*’. The last section introduces and discusses the metrics selected to assess and benchmark the implementation of the plan.

## **Methodological approach**

The methodology used in the development of the *INOTEC–Empresa* Plan was designed to obtain a comprehensive view of the regional actors, stakeholders and factors which could have an impact on innovation and the competitiveness of RAA. It included a document review, participation of the various actors through interviews, a collection of statements from the region’s entrepreneurs and other key players, together with an analysis of their views and a survey of the innovation dynamics of the most relevant Azorean enterprises. Each element of this research methodology is detailed in the following paragraphs.

### ***Documentary research***

The sources consulted included printed documents and the Regional Government Portal (RAA) which is continuously updated; it enabled the monitoring of developments in the region which might have impact on the *INOTEC–Empresa* Plan. The portal included the plans and budgets for the RAA (2005–2007), mid-term guidelines (2005–2008), the socio-economic situation 2004–2006, sustainability perspectives in RAA (RAA, 2006) and several documents with employment data.

To conform with Portuguese requirements the study of these documents was informed by national policy documents, such as:

- the contemporary European Structural Funds Framework Programme for Portugal (for the period 2007–2013) (QREN);
- documents produced by central government regarding the implementation of the revised Lisbon Strategy;
- the XVIIth Government Programme (2005–2009) (Portugal. PCM, 2005);
- the National Technological Plan (2005–2009) (Portugal. CNEL, 2006–2009) and the
- 7<sup>th</sup> European Framework European Research Programme (2007–2013), particularly in the aspects supporting SMEs and those related to the building and strengthening of knowledge regions in Europe.

Statistical data was obtained from the National Statistics Office (Portugal. INE) and other sources, which are part of the National Statistics System in the Ministry of Education, the Ministry of Science, Technology and Higher Education and the Ministry of Employment and Social Security. Data on the development of the Information Society was also obtained from

the Observatory for the Knowledge Society (OSIC) in Portugal, which is under the umbrella of the Agency for the Knowledge Society, UMIC. This data is available through the publication *A Sociedade de Informação em Portugal* (Portugal. UMIC, 2008).

### ***Participatory research***

As Creswell and Clark (2007: 23) describe, whenever research seeks to address political concerns, the participatory approach is the most appropriate. This includes obtaining the collaboration of the individuals who would be affected by the proposals being developed. In the case of *INOTEC–Empresa* Plan, there was an exchange of views within a Strategic Council specifically created for the plan; this was convened three times, during the project's duration (March and June 2006; March 2007). All members at the first of these meetings were invited to present their views on their specific areas of expertise in the broad context of the plan, namely:

- education and professional training,
- availability of scientific and technological infrastructures,
- enterprise competitiveness and
- new areas for entrepreneurship in the region.

### ***Survey analysis***

Designed to reveal the state of innovation dynamics in the RAA economy, a questionnaire was circulated, with the cooperation of the three existing Chambers of Commerce, to some of the most important enterprises in the region. This questionnaire included closed and open questions on several issues:

- enterprise characteristics and its structure; its markets, how actively they search for information relevant to innovation and competitiveness, the effect of public policies;
- the use and exploitation of information and communication technologies;
- issues of certification on quality and environment sustainability;
- entrepreneurship affiliations;
- the most relevant factors that could contribute to an increase in their competitiveness.

Data collection, which lasted from June to December 2006, benefited from the support of *Direcção Regional de Comércio, Indústria e Energia* (Regional Department for Commerce, Industry and Energy), as well as from the Regional Chambers of Commerce.

## **The INOTEC–Empresa plan ('Plano Tecnológico e de Inovação Empresarial INOTEC-Empresa)**

The *INOTEC–Empresa* Plan (Simão, 2008) was approved by the Strategic Council during its March 2007 meeting and was published during the second 2008 semester. Due to regional elections the public presentation was delayed until July 2009.

The first part of the plan was influenced by the European Structural Funds Framework Programme for Portugal (2007–2013) (QREN), in particular by those for the RAA – the PRO-EMPREGO (European Social Funds) (RAA, 2008b) and the PRO-CONVERGÊNCIA (European Regional Development Funds) (RAA, 2008a); it discusses how the RAA should position itself to benefit from the opportunities offered by these, and by the 7<sup>th</sup> European Framework Research Programme, especially in those programmes that concern SMEs and the building and strengthening of knowledge regions in Europe. The second part gave an overview of the Azores Autonomous Region, showing the results of a SWOT analysis and provided the main conclusions drawn from the survey on innovation dynamics of enterprises in the region. This analysis expands and complements the conclusions of the 4<sup>th</sup> CIS – *Community Innovation Survey* (Portugal. MCTES, 2006) and their impact on RAA enterprises.

The programmes of action constituted the third part. There were six chapters:

**Chapter 5** introduced a strategic vision for RAA competitiveness, where special attention was paid to public policies and entrepreneurship strategies.

**Chapter 6** dealt with the development of an integrated infrastructure to support Innovation in RAA – particular attention was paid to the role of public/private partnerships and some strategic guidelines were provided for the implementation of *INOTEC – Empresa*. The creation of a network of Innovation Intermediaries was considered as one of the core elements of this infrastructure.

**Chapter 7** addressed the crucial issue of human resources qualification for innovation and the availability of scientific and technological resources for business innovation. These are the ones that will be described in more detail in subsequent sections.

**Chapter 8** discussed the issues related to the implementation of innovation incentive schemes in the RAA, within the European Structural Funds Framework Programme period (2007–2013) (QREN) and proposed the creation of a Regional Innovation Agency – as a public/private entity – which would perform a ‘brains trust’ role; its main objectives would be to support the development of newly formed knowledge-based enterprises.

**Chapter 9** introduced some examples of innovative exploitation of natural resources including those arising as a consequence of the RAA’s geo-strategic location, for example space communications.

**Chapter 10** characterised the future direction for the decentralised ‘Technology and Competitiveness Park’ (*Polo de Tecnologia e Competitividade*) within the RAA and made proposals to improve the collaboration of AIP–CE (Industrial Association of Portugal–

Entrepreneurship Confederation), one of the National Confederations with the Chambers of Commerce in Azores.

The following section concentrates on the programme for qualification of human resources, to promote the creation of lifelong learning opportunities and the development of scientific and technological capacities for innovation.

## **Programme for qualification of human resources**

Considering the then (at the time of *INOTEC–Empresa* Plan development) educational attainment of human capital in RAA, the key proposal for the programme for *Qualification of Human Resources* was to promote its enhancement through an integrated programme of training and requalification for potential candidates already in the workplace, with the aim of increasing the percentage of the population with 3, 4 and 5 EU-level qualifications. To achieve this, it was recognised that there was a need to raise aspirations and improve access to attractive learning facilities. These measures would increase the self-motivation of managerial staff to improve their own qualification levels, while encouraging their workpeople to take advantage of re-qualification opportunities. In Portugal, organisations are often reluctant to give time off for further education and the pursuit of higher qualifications is not always appreciated by the older generation.

Various initiatives were outlined with the aim of attracting non-traditional students to study for higher qualifications. These include the promotion of *Open Days* for prospective students; the offering of *Taster Courses* and preparatory courses, and specially designed to ensure the success of non-traditional candidates wishing to access HE. To overcome the barriers felt by the students, these initiatives also included the implementation of student-centred teaching and learning methodologies as well as assessment approaches and an improvement in the flexibility of the teaching timetable. Because of the archipelagic nature of the region, emphasis on the use of e-learning technologies and of blended learning approaches to course delivery was strongly recommended. As one of the mechanisms to promote a student-centred approach, the introduction of Personal Study Plans (PSP) was also recommended, while competences acquired by individuals in all areas, including the use of Information and Communication Technologies, was also registered.

Again, taking into account the present state of development of educational levels in RAA, the *INOTEC–Empresa* Plan strongly recommended wider use of the CET courses (Cursos de Especialização Tecnológica), in particular those already taught at the Technological School *ENTA* (Escola de Novas Tecnologias dos Açores) (ENTA). These are post secondary, non-university training level-4 EU qualifications, addressing the specific needs of the intermediary level workforce. Apart from their flexibility, CET's were also undertaken under the auspices of an agreement, or protocol, with at least one higher education institution

(HEI), guaranteeing later access to HE. These protocols, agreed between the provider of CET and HEI for defined programmes of study, established the conditions for recognition of training for advanced entry, within those HE programmes, without the need to sit the National HE Access examination. This is in accordance with Decree-Law 88/2006, of 23rd May (article n.3) (Portugal, MCTES, 2006) which constitutes the CET regulatory framework in Portugal. *INOTEC–Empresa* Plan and further recommends that there should be a strengthening of the link between the CET's provided by ENTA and the University of Azores. Especially, there would be an increase in CET's offered in the area of Information and Communication Technologies with an initial common structure, followed by greater specialisation and a stronger involvement of regional enterprises, chambers of commerce and local government in several aspects of course organisation.

This approach also required an agreed definition of programme content between the Portuguese Government and these stakeholders for the creation of practical work experience opportunities. It is also recommended that ENTA, which is now mainly active on S. Miguel island and in the capital city Ponta Delgada, should strengthen its activity through the creation of autonomous centres in the other islands, and coordinated in order to optimise the sharing of human and material resources. Above all, *INOTEC–Empresa* recommended that there should be an active campaign at regional level to increase entrepreneurs' involvement and to promote awareness of the benefits to be found in developing flexible ways to allow suitable candidates to attend CET's courses.

## **Programme for development of scientific and technological capacities for innovation**

One of the recommendations of the *INOTEC–Empresa* Plan was that an effort should be made by all stakeholders to produce the reliable data needed for monitoring and benchmarking the impact of innovation policies. However, because the initial productive capacity was limited by a relatively weak technological base; difficulties were experienced by Azorean enterprises to move up to a higher level of competitiveness. This weakness was monitored by several indicators, such as (data for 2003; Correia and Mota, 2008):

- R and D staff as per cent of active population: 0.32 per cent in RAA, compared with 0.47 per cent in Portugal average (*op. cit*, Graph B.2.1);
- R and D effort expressed as percentage of working time spent on research, spread over the following types of institutions – Higher education, enterprises, state and private sectors. This was significantly higher in RAA in Higher education (ca. 60.1 per cent) than the same indicator for Portugal mainland (43.5 per cent), and also that for Portugal's other autonomous region (Madeira; 32.8 per cent) (*op. cit*, graph B.2.3);

- Total expenditure on R and D in Azores – although increasing since the 1990s, was allocated to the University of Azores (62.7 per cent), the State (18.2 per cent), enterprises (5.1 per cent) and private sector (14 per cent) (*op. cit*, graph B.3.3). The spend was mainly concentrated in the areas of biology, technologies, maritime resources and geosciences; this expenditure represents only 0.5 per cent of GNP in Azores, compared with the average for Portugal which is 0.78 per cent of the GNP. It is a value that is far below the target established by the National Technological Plan for the year 2010, which is 1 per cent (Portugal. CNEL, 2008).

The Lisbon Strategy, which aims to develop Europe into the most competitive and dynamic knowledge-based economy in the world by 2010, incorporates a policy goal that requires R and D expenditure in the European economies to reach 3 per cent of GDP by 2010 (Comissão, 2002).

R and D intensity is extensively used by scholars and policy-makers as a benchmark for measuring the innovativeness of a firm, an industry, a region or a country. Nevertheless, the *European Innovation Scoreboard* shows that almost half of European innovators do not monitor intramural or in-house R and D. (Innometrics, 2008). Such non-R and D innovation includes the purchase of advanced machinery and/or computer hardware; usually, these are specifically to implement new or significantly improved products or processes. An increase in the purchase of rights to use patents and non-patented inventions, licenses, know-how, trademarks and software is also necessary.

Furthermore, internal or external training for keeping personnel up to date is an important expense for the innovative firm. Generally speaking, non-R and D innovators are concentrated in the low-technology manufacturing and service sectors. The distribution of these non-R and D innovators is also skewed towards small- and medium sized firms. It is in such circumstances that *INOTEC–Empresa* plan deals with the development of an integrated infrastructure to support Innovation in RAA. The creation of a network of Innovation Intermediaries (Howells, 2006) is considered to be one of the core elements of this infrastructure.

## **Development of the Information Society in RAA**

Some of the most relevant figures characterising the Information Society in RAA, are (Correia and Mota, 2008):

- in 2006, broadband penetration in households was 24 per cent in Portugal and in RAA it reached 27 per cent;

- the percentage of households with PCs in 2005 and 2006 in the RAA was 41 per cent and 45 per cent, respectively; these values can be compared with similar values for all Portugal which were 42 per cent and 45 per cent, respectively;
- for Internet connection, the RAA (in 2006) has a higher value – 38 per cent – than the average for Portugal (35 per cent) (*op.cit.*: graph C.1.2.2).

Taking into consideration the archipelagic nature of the RAA and the central role of a networked infrastructure for innovation and learning in the region, *INOTEC–Empresa* plan strongly recommended that the RAA should reach and eventually overtake the target established by the Portuguese government, within the renewed Lisbon Strategy, by the year 2010. This would mean at least 50 per cent of households being connected to the Internet by broadband (Portugal. CNEL, 2008).

## **Metrics for benchmarking**

The strategic vision defined by the *INOTEC–Empresa* Plan was in accord with the Regional Government GNP growth forecast of above 5 per cent per year for the period 2007–2013. However, the current financial crisis has postponed this goal for at least five years. Innovation in enterprises is at the core of this challenge if RAA is to converge into a knowledge-based region and take full advantage of the digital economy.

In order to stimulate the dynamic process of this innovation policy, benchmarking emerged as a powerful technique for measuring the success of policies and their outcomes, across industries, sectors, products and services. It is in this context that the development of an ‘Innovation Scoreboard’ for European regions (IRS, 2002–2009) has been incorporated into the *INOTEC–Empresa* Plan. Only through benchmarking is it possible to monitor and assess the impact of innovation policies at the regional level. This monitoring activity should be based on metrics discussed and accepted by all stakeholders – namely, regional government, enterprises, Chambers of Commerce, and academia.

The *INOTEC–Empresa* Plan is therefore based on an analysis of:

- the point of departure for the region, setting the baseline for the development of the Plan;
- the targets for 2010 established by Portugal, within the scope of the National Technological Plan for Portugal (Portugal, CNEL, 2008), which integrates the response of Portugal to the European Union regarding the implementation of the Renewed Lisbon Strategy, and will be in accord with Regional Benchmarking exercises in other European regions (*e.g. Region Lazio Innovation Scoreboard*) (IRS, 2002–2009).



The proposed benchmarking methodology adapted the Innovation Scoreboard to local requirements and introduced a set of regional indicators and targets. In this chapter only Tables 3.1 and 3.2, referring to those groups of indicators relevant for the RAA Knowledge Creation Programmes, follow. For each indicator there are specific associated targets:

- Target for 2010, for Portugal, obtained from the National Technological Plan
- EU-25 average (the most updated value available)
- EU-15 average (the most updated value available)
- Target for 2015, RAA – ten years of the implementation of the *INOTEC– Empresa* and European Structural Funds Framework Programme.

Although it was not possible to summarise all the indicators defined in the *European Innovation Scoreboard* for the RAA, in the context of the *INOTEC–Empresa* Plan, a detailed compilation of several indicators was completed (Correia and Mota, 2008) and provisionally accepted. They will be refined and expanded as necessary.

**Table 3.1. Knowledge creation: qualified human resources.**

Strategic objective	Population indicators	Portugal target (2010)	Portugal actual	EU15 EU25	Eu15	RAA 'currently'	RAA target (2015)
Enhance education levels	Population with upper secondary education diploma ( percentage of the age-group 25–64)	15	13.5 (2006)	22.8 (2005)	–	7.3 (2001)	20
	Population with upper secondary education diploma ( percentage of the age-group 20–24)	65	49.6 (2006)	77.7 (2006)	–	45.9 (2001)	75
	S and T graduates per 1000 inhabitants (20–29 years of age)	12	12.6 (2006)	13.2 (2005)	–	–	13
Promote lifelong learning	Lifelong learning (per 100 inhabitants of the age group 25–64)	12.5	4.6 (2005)	11 (2005)	–	–	20
Mobilise Portuguese citizens towards information and knowledge society	Regular usage of the Internet by individuals (per cent)	60	31 (2006)	47 (2006)	–	28 (2006)	80
	Percentage of households with broadband access to Internet	50	34 (2006)	77.3 (2005)	–	27 (2006)	80
	Students per PC	5	10.3 (2005)	–	–	–	4

	Percentage of fully online public services	100	90 (2007)	58 (2007)	52 (2006)	–	100
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Sources: Portugal. CNEL, 2008; Correia and Mota, 2008.

**Table 3.2. Knowledge creation: science and technology.**

Strategic objective	R and D Indicators	Portugal target (2010)	Portugal actual	EU15 EU25	Eu15	RAA 'currently'	RAA target (2015)
Strengthen scientific and technological capabilities	Researchers per 1000 workers	5.3	3.4 (2005)	5.8 (2002)	–		6
	New PhDs in S and T per 1000 inhabitants (in the age-group 25–45)	0.45	0.3 (2003)	0.49 (2003)			0.6
	Scientific production per million inhabitants	609	406 (2003)	639 (2003)	–		500
	R and D effort expressed as per 1000 of working population	7.5	4.7 (2003)	–	10.5 (2003)		10
	Public expenditure in R and D ( percentage of GNP)	1	0.5 (2005)	0.65 (2005)	0.70 (2003)		1.5
Mobilise enterprises towards Rand D	Enterprise expenditure in R and D (percentage of GNP)	0.8	0.26 (2003)	1.26 (2003)	1.30 (2003)		1.5

(Sources: Portugal, CNEL, 2008; Correia and Mota, 2008)



Using this approach, several 2015 targets for RAA were established, as shown in Tables 3.1 and 3.2. These are ambitious and above the national average established for Portugal in 2010 (Portugal, CNEL, 2008)

## Conclusion

The main problem with implementing the *INOTEC–Empresa* Plan was a cultural one, connected with a lack of inter-institutional collaboration (Simão, 2008). Resolving this would help to avoid duplication of initiatives and allow for the establishment of well defined targets. These are at the core of the convergence challenge that is particularly relevant for the outermost European regions.

Proper implementation of the *INOTEC–Empresa* Plan should make it possible for the RAA to achieve, in 2015, an increase in performance of at least 10 per cent on Portugal's 2010 figures, but only a culture of entrepreneurship in the RAA can make this a reality.

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